17.2.4.2 Long-term Vegetation Transects. Sagebrush-dominated communities have been listed among the most endangered North American ecosystems because lost to agriculture, overgrazing, and invasion by nonnative annual plant species. Before 1950 and the establishment of the INEEL, the area occupied by the INEEL was heavily grazed. In 1950, permanent vegetation plots were established. Since their inception, these plots have been sampled nine times. The data from these plots allow researchers to study vegetation dynamics in large areas of natural sagebrush steppe in the absence of domestic livestock grazing and to evaluate patterns of change in cover, density, and distribution of major species and life forms that have occurred over a 45-year period. In 1999, this information was summarized in a report called the *Long-term Vegetation Dynamics in Sagebrush Steppe at the Idaho National Engineering and Environmental Laboratory* (Anderson and Inouye 1999). This report analyzes data for 47 "core" plots located on central portions of the INEEL and 32 "peripheral" plots located on the periphery of the INEEL. Although this analysis primarily focuses on the impacts of grazing on the periphery of the INEEL to plant attributes, it is valuable to the OU 10-04 ERA. This document is Appendix H12.

When the plots were first established in 1950, the area was in a severe drought. Since then, perennial grasses have increased in the plots. This seems to be in step with natural recovery from drought and overgrazing. During this time, the species richness on the plots has changed very little; however, the plant species heterogeneity has increased. Study plots outside the INEEL have produced similar results. Increases in shrub cover, perennial grasses, mean richness, and heterogeneity, have all been observed, as well as similar relative vascular plant cover. The major difference in plots is the percentage of cover of annuals versus perennials. An in-depth study of these plots can be found in Appendix H12. The uniqueness of the INEEL allows for continued study of the vegetation dynamics. Findings from these studies will help in the management of plant species on the INEEL. Weed control, recovery from fire, and the control of grazing will all benefit from long-term studies of these vegetation transects.

17.2.4.3 RESL Data. The Radiological and Environmental Sciences Laboratory collected a significant number of data during the past thirty years. This information was used to assess the OU 10-04 food web modeling, but the results of the analysis should be used with caution. The RESL studies were not designed for this type of analysis. Some of the concentrations in the abiotic media were taken from areas surrounding the facilities, not at the same locations, and not during the same timeframe as were the biota samples (i.e., none of the data was co-located), and the number of samples was limited (sometimes only two samples of one species was available). These studies were performed prior to remediation, during a time when significant concentrations of radionuclides were available in the TRA warm waste pond and at the INTEC. They may not reflect the transfer of these radionuclides at lower concentrations. To use this information to update the OU 10-04 exposure modeling would require significant rework and possibly additional sampling. Abiotic data from radioactive leaching ponds at TRA and areas of INTEC were used to calculate possible tissue concentrations using the terrestrial food web model. Tissue concentration data collected in the same areas were then compared to the calculated values. Cs-137, Pu-238, and Pu-239/240 were sampled and data were presented from both abiotic and biotic media to perform the comparison.

Appendix H4 provides a preliminary comparison of the RESL data to the OU 10-04 food web modeling. The results of this preliminary comparison indicate the following. At TRA, sampled tissue concentrations of Cs-137, Pu-238, and Pu-239/240 in both the deer mouse and mourning dove were greater than were modeled tissue concentrations. Sampled concentrations for the marsh hawk and American kestrel were very close to modeled tissue concentrations. At INTEC, sampled tissue concentrations of Cs-137 in mourning doves, sage grouse, and American kestrels were greater than estimated tissue concentrations based on modeling.

17.2.5 Receptors and Habitats of Concern

Extensive discussion of the flora and fauna present at the INEEL is presented by both VanHorn and others (1995; DOE/ID 1999) and is summarized in Appendix B. This information is not presented elsewhere in this RI/FS. The information gathered was important to identifying the ecological receptors of concern.

A functional grouping approach was used in the WAG ERA assessments, whereby receptors were grouped by the items of food they consume and their trophic level in the site food web. In order to simplify the OU 10-04 ERA, while incorporating large amounts of data, specific ecological entities (species) were identified as receptors, rather than listing the functional groups to which the receptor belongs. This selection is documented in Appendix H6. Multiple criteria were used in the process. The abundance and distribution of a species was a major consideration. Rare receptors (e.g., gray wolf and black tern) and occasional or uncommon receptors (e.g., long-eared owl, bobcat, or barn swallow) were not selected, since they are not primary components in the INEEL food web. Every attempt was made to include all functional groups. Professional judgement, however, also played a factor in the receptor selection. The availability of pertinent toxicity data, exposure parameters, and site-specific data were also key factors in the selection of primary receptors. The availability of population data presented on geographical information system spatial distribution maps was an additional consideration when selecting a particular species to represent one or more functional groups. Table 17-10 presents the applicable functional groups associated with the particular receptor species. By refining the list of receptors, an easier method was obtained to quantify risks to multiple receptors and pathways over a very large spatial area.

Identification of receptors and habitats of special concern is necessary to adequately characterize risk. Although the species survey is not as extensive as may be desired for a site of this size, the INEEL has the benefit of some very extensive studies to identify and categorize its species. Appendix D of the Guidance Manual (VanHorn, Hampton, and Morris 1995) presents a comprehensive list of plant and animal species and federal and/or state threatened, endangered, and sensitive species. Although species of special concern and sensitive species do not receive legal protection, they are included here because they are present at the INEEL.

17.2.5.1 Receptors of Concern in Aquatic Habitats. Aquatic habitats at the INEEL are limited to the banks of the Big Lost River and the Big Lost River Sinks. The Sinks contain water only intermittently. The various holding ponds on the INEEL produce limited artificial aquatic habitats. Although no aquatic ecosystem is addressed per se in this ERA, the blue-winged teal, an AV143 aquatic avian herbivore, was selected as a key receptor, since it was used to represent other aquatic species and species of concern (e.g., the trumpeter swan and white-faced ibis). The blue-winged teal, and other waterfowl and shorebirds, could be present at facility waste ponds and sewage lagoons, as well as other limited aquatic habitats at the INEEL.

17.2.5.2 Threatened or Endangered Species and Other Species of Concern. In 1973, Public Law 93-205, the Endangered Species Act, was enacted and is administered by the U.S. Fish and Wildlife Service. As amended, this act federally protects certain species of plants and animals and their critical habitats and authorizes the Secretary of the Interior to develop and implement recovery plans for each species listed. These species and subspecies are listed in 50 Code of Federal Regulations 17.11 and 17.12 as either endangered or threatened. Table 17-11 lists the threatened and endangered species that may be found at the INEEL and indicates their status.

Table 17-10. Individual receptors and associated functional groups.

Class	Functional Group	Receptor Taxonomic Name	Receptor Common Name
Avian herbivores	AV122	*Zenaida macroura*	Mourning dove
Avian (aquatic) herbivores	AV143	*Anas discors*	Blue-winged teal
Avian insectivores	AV222	*Amphispiza belli*	Sage sparrow
Avian carnivores	AV322	*Buteo regalis*	Ferruginous hawk
Avian carnivores	AV322	*Lanius ludovicianus*	Loggerhead shrike
Avian carnivores	AV322A	*Athene cunicularia*	Burrowing owl
Avian omnivores	AV422	*Pica pica*	Black-billed magpie
Mammalian herbivores	M122	*Odocoileus hemionus*	Mule deer
Mammalian herbivores	M122A	*Brachylagus idahoensis*	Pygmy rabbit
Mammalian insectivores	M210A	*Plecotus townsendii*	Townsend's western big-eared bat
Mammalian omnivores	M422	*Peromyscus maniculatus*	Deer mouse
Mammalian carnivores	M422A (M322)	*Canis latrans*	Coyote
Reptilian insectivores	R222	*Sceloporus graciosus*	Sagebrush lizard
All vegetation	—	—	Plants

Table 17-11. Threatened or endangered species, sensitive species, and species of concern that may be found at the INEEL.[a]

Common Name	Scientific Name	Federal Status[b,c]	State Status[c]	BLM Status[c]	USFS[f] Status[c]
Plants					
Lemhi milkvetch	*Astragalus aquilonius*	—	S	S	S
Painted milkvetch[e]	*Astragalus ceramicus var. apus*	3c	R	—	—
Plains milkvetch	*Astragalus gilviflorus*	NL	1	S	S
Winged-seed evening primrose	*Camissonia pterosperma*	NL	S	S	—
Nipple cactus[e]	*Coryphantha missouriensis*	NL	R	—	—
Spreading gilia	*Ipomopsis (=Gilia) polycladon*	NL	2	S	—
King's bladderpod	*Lesquerella kingii var. cobrensis*	—	M	—	—
Tree-like oxytheca[e]	*Oxytheca dendroidea*	NL	R	R	—
Inconspicuous phacelia[d]	*Phacelia inconspicua*	C2	SSC	S	S
Ute ladies' tresses[d]	*Spiranthes diluvialis*	LT	—	—	—
Puzzling halimolobos	*Halimolobos perplexa var. perplexa*	—	M	—	S
Birds					
Peregrine falcon	*Falco peregrinus*	3c	E	—	—
Merlin	*Falco columbarius*	NL	—	S	—
Gyrfalcon	*Falco rusticolus*	NL	SSC	S	—
Bald eagle	*Haliaeetus leucocephalus*	LT	T	—	—
Ferruginous hawk	*Buteo regalis*	C2	SSC	S	—
Black tern	*Chlidonias niger*	C2	—	—	—
Northern pygmy owl[d]	*Glaucidium gnoma*	—	SSC	—	—
Burrowing owl	*Athene cunicularia*	C2	—	S	—
Common loon	*Gavia immer*	—	SSC	—	—
American white pelican	*Pelicanus erythrorhynchos*	—	SSC	—	—
Great egret	*Casmerodius albus*	—	SSC	—	—
White-faced ibis	*Plegadis chihi*	C2	—	—	—
Long-billed curlew	*Numenius americanus*	3c	—	S	—
Loggerhead shrike	*Lanius ludovicianus*	C2	NL	S	—
Northern goshawk	*Accipiter gentilis*	C2	S	—	S
Swainson's hawk	*Buteo swainsoni*	—	—	S	—
Trumpeter swan	*Cygnus buccinator*	C2	SSC	S	S
Sharptailed grouse	*Tympanuchus phasianellus*	C2	—	S	S
Boreal owl	*Aegolius funereus*	—	SSC	S	S

Table 17-11. (continued).

Common Name	Scientific Name	Federal Status[b,c]	State Status[c]	BLM Status[c]	USFS[f] Status[c]
Flammulated owl	*Otus flammeolus*	—	SSC	—	S
Mammals					
Gray wolf[g]	*Canis lupus*	LE/XN	E	—	—
Pygmy rabbit	*Brachylagus (=Sylvilagus) idahoensis*	C2	SSC	S	—
Townsend's Western big-eared bat	*Corynorhinus (=Plecotus) townsendii*	C2	SSC	S	S
Merriam's shrew	*Sorex merriami*	—	S	—	—
Long-eared myotis	*Myotis evotis*	C2	—	—	—
Small-footed myotis	*Myotis ciliolabrum (=subulatus)*	C2	—	—	—
Western pipistrelle[d]	*Pipistrellus hesperus*	NL	SSC	—	—
Fringed myotis[d]	*Myotis thysanodes*	—	SSC	—	—
California myotis[d]	*Myotis californicus*	—	SSC	—	—
Reptiles and amphibians					
Northern sagebrush lizard	*Sceloporus graciosus*	C2	—	—	—
Ringneck snake[d]	*Diadophis punctatus*	C2	SSC	S	—
Night snake[e]	*Hypsiglena torquata*	—	—	R	—
Insects					
Idaho pointheaded grasshopper[d]	*Acrolophitus punchellus*	C2	SSC	—	—
Fish					
Shorthead sculpin[d]	*Cottus confusus*	—	SSC	—	—

a. This list was compiled from a letter from the U.S. Fish and Wildlife Service (USFWS) (1997) for threatened or endangered, and sensitive species listed by the Idaho Department of Fish and Game (IDFG) Conservation Data Center (CDC 1994 and IDFG web site 1997) and Radiological Environmental Sciences Laboratory documentation for the INEEL (Reynolds et al. 1986).
b. The USFWS no longer maintains a candidate (C2) species listing, but addresses former listed species as "species of concern" (USFWS 1996). The C2 designation is retained here to maintain consistency between completed and ongoing INEEL Ecological Risk Assessments (ERAs).
c. Status codes: INPS=Idaho Native Plant Society; S=sensitive; 2=State Priority 2 (INPS); 3c=no longer considered for listing; M=State of Idaho monitor species (INPS); NL=not listed; 1=State Priority 1 (INPS); LE=listed endangered; E=endangered; LT=listed threatened; T = threatened; XN = experimental population, nonessential; SSC=species of special concern; and C2 = see item b, formerly Category 2 (defined in CDC 1994). BLM=Bureau of Land Management; R = removed from sensitive list (nonagency code added here for clarification).
d. No documented sightings at the INEEL; however, the ranges of these species overlap the INEEL and are included as possibilities to be considered for field surveys.
e. Recent updates that resulted from Idaho State Sensitive Species meetings (BLM, USFWS, INPS, and USFS) - (INPS 1995, 1996, and 1997).
f. U.S. Forest Service (USFS) Region 4.
g. Anecdotal evidence indicates that isolated wolves may occur on the INEEL. However, no information exists to substantiate hunting or breeding onsite (Morris 1998). Currently under consideration for delisting.

Three comprehensive surveys of rare vascular plants have been conducted at the INEEL. The first was by Cholewa and Henderson in 1984. More recently, surveys were conducted by James Glennon in 1990 and by Karl Holte and James Glennon in 1993. Holte and Glennon made extensive searches of the INEEL and immediate vicinity during the exceptionally wet 1993 growing season. Seven sensitive plants are known to exist at the INEEL. One federal candidate occurs on Big Southern Butte.

Sticky phacelia (*Phacelia inconspicua*) is a plant species on the Federal Candidate List. Plains orophaca (*Astragalus gilviflorus*) is categorized as State Priority 1, which means that it is in danger of becoming extinct or extirpated from Idaho in the foreseeable future. Spreading gilia (*Ipomopsis polycladon*) is State Priority List 2, which means that it is in danger of becoming Priority 1 if factors contributing to its population decline, habitat degradation, or loss continue. Three species are considered State Sensitive: Lemhi milkvetch, (*Astragalus aquilonius*), wing-seeded evening-primrose (*Camissonia pterosperma*), and Oxytheca (*Oxytheca dendroidea*). These species could become Priority 1 or 2 without active management or removal of threats. Nipple coryphantha (*Escobaria missouriensis*) and puzzling halimolobos (*Halimolobos perplexa* var. *perplexa*) are both on the State Monitor List, indicating they are uncommon at the INEEL but have no identifiable threats. Cholewa and Henderson (1984) originally listed painted milkvetch (*Astragalus ceramicus* var. *apus*), Large flowered gymnosteris (*Gymnosteris nudicaulis*), and King's bladderpod (*Lesquerella kingii* var. *cobrensis*) on the state or federal lists, but they have since been removed. The summaries of threatened or endangered species have been presented in detail by VanHorn, Hampton, and Morris (1995). This information has been updated and is discussed in the following sections.

The only bird species at the INEEL currently recognized as threatened or endangered under the Endangered Species Act are the bald eagle (*Haliaeetus leucocephalus*), a winter visitor, and the peregrine falcon (*Falco peregrinus*). The bald eagle was recently downgraded from endangered to threatened. The peregrine falcon remains endangered. The ferruginous hawk (*Buteo regalis*), white-faced ibis (*Plegadis chihi*), black tern (*Chlidonias niger*), northern goshawk (*Accipter gentilis*), pygmy rabbit (*Brachylagus (=Sylvilagus) idahoensis)*, and the Townsend's western big-eared bat (*Corynorhinus (=Plecotus) townsendii*) are all candidates for the federal list. These candidate species are those for which the U.S. Fish and Wildlife Service has information suggesting that a change in status, to threatened or endangered, may possibly be appropriate but for which conclusive data are not available.

The State of Idaho recognizes two separate classes of rare fauna: species of special concern and threatened and endangered wildlife. Species of special concern known to exist at the INEEL include the common loon *(Gavia immer)*, American white pelican *(Pelicanus erythrorhynchos)*, ferruginous hawk, Northern pygmy owl (*Glaucidium gnoma)*, California myotis (*Myotis californicus)*, merlin (*Falco columbarius)*, and great egret (*Casmerodius albus)* (Moseley and Groves 1992).

There was a need for more complete information regarding the presence of suitable habitat for T/E (threatened or endangered) species and species of concern (formerly designated C2) at sites at the WAGs. This information was required to support the interpretation and characterization of ecological risk predicted by the WAG and OU 10-04 ERAs. To obtain this information, a biological survey was conducted of state and federal T/E and species of concern that may inhabit or frequent contaminated sites and areas within facilities, and other areas of the INEEL (as defined by the FFA/CO) for WAGs 1, 2, 3, 4, 5, 6, 7, 9, and 10. These surveys are presented in Appendix H7.

17.2.5.3 Ecologically Sensitive Areas. Several areas have been identified on the Ecologically Sensitive Areas Overlay map as having significant value for supporting sensitive and/or unique plant and wildlife species and communities on site (Reynolds 1993). The first of these areas is the area along the Big Lost River and Birch Creek. Riparian and wetland communities support a great variety of species. Buffer areas that define a reasonable area to protect these habitats have been identified (Reynolds 1993).

Some areas of the site have been identified by past research as biological reference areas having particular natural resource values. These biological reference areas exhibit a variety of nesting areas for hawks, maternity roosts for bats, and periodic gathering areas for elk, deer, and pronghorn (Reynolds 1993).

Two key research transects have been identified on the overlay that cross the center of the site from north to south and northwest to southeast. Vegetation data collected from these transects since 1949 provide crucial information pertaining to the impacts of the INEEL activities on the natural environment (Reynolds 1993). The undisturbed status of these areas is expected to continue.

17.2.5.3.1 Sage Grouse Leks—Sagebrush habitats within the INEEL site are important. Since 1980, sage grouse (*Centrocercus urophasianus*) populations have declined as much as 45 to 82%. While still hunted in nine states, the bird is declining in Oregon, Washington, Idaho, Nevada, Utah, Colorado, Wyoming, Montana, California, and in both North and South Dakota. It has vanished completely from Arizona, New Mexico, Oklahoma, Kansas, Nebraska, and British Columbia. In Alberta and Saskatchewan, the Canadian government has listed the sage grouse as endangered. These sensitive areas provide breeding habitats for sage grouse residing at the INEEL.

Unfortunately, a decline in numbers of sage grouse has also been observed at the INEEL. More and more leks are being abandoned, while fewer new leks are discovered. Results of the most recent breeding birds survey continue to indicate a decline in bird numbers from year to year. The greatest number of birds observed on site was 90 in 1988 (seen at 50% of the stops on the routes). In 1998, that number had shrunk to 13 (seen at 7.2% of the stops on the routes). The cause of the great decline, both nationwide and at the INEEL, is presently unknown.

Several of the leks fall within the ordnance areas shown on Figure 17-3. It is not known whether these leks are currently used by the grouse or if they have been abandoned and are not in use. Sage grouse leks are spread widely throughout the site, with the majority falling outside the ordnance areas. The northern area of the INEEL also supports a significant concentration of sage grouse (Reynolds 1993). The sage grouse was selected as a receptor of concern.

17.2.5.3.2 Pronghorn Wintering Area—The northern area of the INEEL is at the mouth of the north-south trending valleys and provide an important wintering area for pronghorn (Antilocapra americana). The area's elevation, unique vegetation, and available water provide important winter habitat and ideal migratory corridor for pronghorn. Pronghorn can be found year-round at the INEEL. During winter months, from 4500 to 6000 pronghorn use the INEEL. This is about 30% of the total population of pronghorn in Idaho. Five elk (Cervus elaphus) herds and a resident population of mule deer (Odocoileus hemionus) also share the INEEL and use the ecologically sensitive areas marked in Figure 17-3. The mule deer was selected as a receptor of concern and to represent the other large mammalian herbivores.

17.2.6 Selection of Management Goals, Endpoints, and Measures

Selection of management goals, assessment endpoints, and measures for the INEEL OU 10-04 ERA constituted an important step of the problem formulation. The assessment endpoint white paper (Appendix H6) presents the goals, endpoints and measures in greater detail. Two elements are required to define an assessment endpoint: (1) the valued ecological entity (e.g. a species, a functional group, an ecosystem function or characteristic, a specific habitat, or a unique place) and (2), the characteristic about the entity that is important to protect and potentially at risk (e.g., reproductive viability) (EPA 1996).

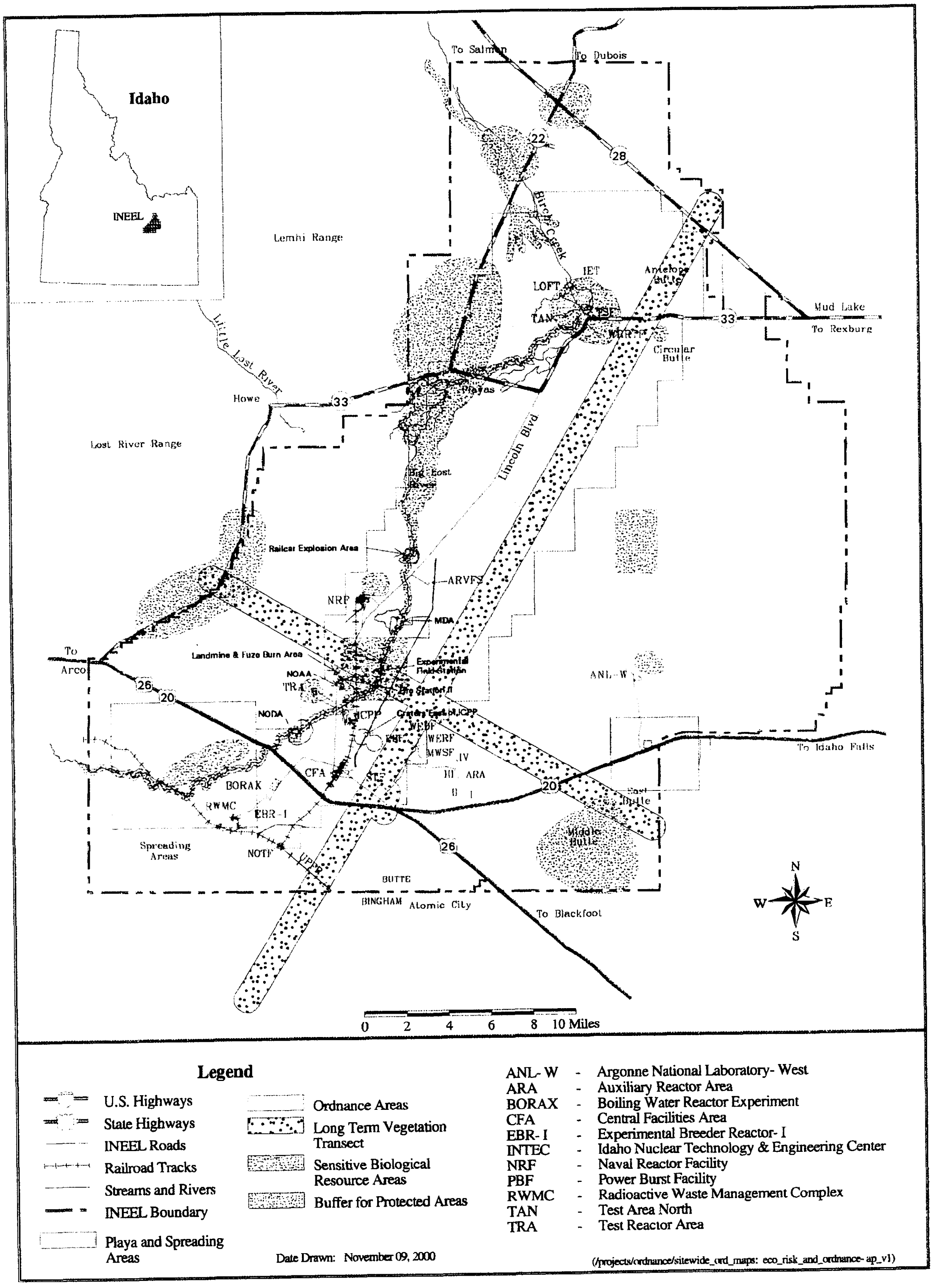

Figure 17-3. Ecologically sensitive areas overlay.

The assessment endpoints for the OU 10-04 ERA can be summarized as follows:

- *De minimis* risk (defined below) to INEEL plant communities as forage base for herbivores and upper trophic level receptors
- *De minimis* risk to soil fauna communities that support plant communities and upper trophic level receptors
- *De minimis* risk to INEEL terrestrial wildlife communities, terrestrial T/E species and species of concern
- *De minimis* risk to INEEL aquatic wildlife communities, aquatic T/E species and species of concern
- *De minimis* risk to INEEL game species populations
- *De minimis* risk to the INEEL prey base.

These assessment endpoints represent components of scientific management decision points (SMDPs) (b) and (c) (EPA 1996), and reflect the general consensus of the risk assessment team. By adopting an approach similar to that presented by Suter et al. (1995), expressing endpoints in relation to *de minimis* risk offers a method for categorizing ecological risk in terms of remediation strategies. Such an approach is expected to be useful to risk managers.

De minimis ecological risk is defined as risk corresponding to

- Less than 20% reduction in the abundance or production of an endpoint population within suitable habitat within a unit area.
- Loss of less than 20% of the species in an endpoint community in a unit area.
- Loss of less than 20% of the area of an endpoint community in a unit area. The term "unit area" refers to a discrete area that is at risk and may be subject to a regulatory or remedial action.

Loss of more than 20% may also be *de minimis* if the community has negligible ecological value (e.g., a baseball field) or if the loss is brief because the community is adapted to physical disturbances (e.g., the plant communities of stream gravel bars) (Suter 1995).

Due to the large size of the INEEL, the risk assessment team decided that an evaluation of the assessment areas would best represent the "measures" against which the endpoints could be assessed. Based on the WAG ERA results, attempts to measure abundance, habitat, or species loss on a landscape scale were not warranted or feasible.

The INEEL is characterized by having large inter-facility (WAG) areas that have had limited disturbance in comparison to other areas of site activities. This lack of physical or other disturbance (e.g., grazing) occurring in the areas between the WAGs has resulted in areas of the INEEL becoming an ecological treasure (Anderson 1999). Therefore, due to the impracticality and costs associated with assessing species or community abundance or production on such a large scale, it was determined that loss of 20% of habitat important to the selected species of concern would be equivalent to the *de minimis* risk definition. This assessment (or measure) is based on the refined assessment areas compared to the total INEEL habitat.

The de minimis risk concept has its roots in the practice of law. In law practice, the concept is applied to situations in which the item is small or irrelevant in the context of the case. The de minimis risk concept as applied at the INEEL is intended to identify those ecological risks that are important, and remove those that are small in the context of the INEEL. Based on the preceding discussion, endpoint populations including species of concern, game populations and prey base species are specifically protected under this approach. Protecting these endpoint species is also protective of other non-endpoint species and populations. A 20% change in individuals of a population or species within an exposure unit community is considered the limit of detection, based on variability of the numbers of each. Note that the de minimis approach as applied at the INEEL also considers the habitat quality of the affected sites. Most of the WAG sites are disturbed, of limited ecological habitat value, and likely support only species tolerant of human disturbance. Thus, additional species extinction within the WAG boundaries is not expected. In addition, the overall area of the WAGs is minimal compared to that of the INEEL itself.

17.2.7 The Conceptual Site Model

The focus in developing the conceptual site model was to obtain an overview of the movement of contaminants through the INEEL environment. The model was developed by Van Horn et al. (1995) and has served as the basic model for consistently conducting the WAG ERAs. It also served in developing the sampling plan to support the OU 10-04 ERA. Figure 17-4 presents the conceptual site model. This basic model has proven effective in communicating the basic concepts associated with the ERA, while allowing the flexibility to adapt to individual WAG or site issues.

17.3 Analysis

The *Guidelines for Ecological Risk Assessment* (EPA 1998) states that the analysis phase is a process to examine the primary components of risk, exposure, and effects and their relationships between each other and ecosystem characteristics. The EPA (1998) also states that the nature of the stressor influences the types of analyses conducted, and the results may range from highly quantitative to qualitative. As discussed in the problem formulation, the OU 10-04 ERA focuses on evaluating the contamination at the WAG sites, migration of that contamination from the WAGs, and the spatial contribution to risk. It is also critical to identify receptors and contaminants of concern at the INEEL-wide level for both assessment of risk and for future monitoring. For the OU 10-04 ERA, analysis comprised two evaluations: (1) a GIS (geographic information systems) analysis performed using interpretive maps to support the spatial evaluation, and (2) assessment of the WAG ERA receptors using the results of the WAG ERAs to identify species and contaminants of concern. Figure 17-5 is a flow diagram of the analysis phase as it applies to the OU 10-04 ERA.

17.3.1 GIS Mapping and Spatial Analysis

17.3.1.1 Delineation of Contaminant Spatial Extent. The extent of contamination spread from the WAGs onto the areas outside the WAG fences has been a major component of this assessment. As discussed in the problem formulation phase and Appendix H8, the sizes of the WAG assessment areas were reduced based on both the air modeling (Appendix H5) and ecological sampling (Appendix H3). Original isopleths estimating the contaminated areas were compared to the sampling data, which reduced the WAG facilities' boundaries (either inside the fences or as designated by the CERCLA site mapping). Using vegetation maps and knowledge from site visits, the reduced WAG areas were assigned a vegetative class (e.g., sagebrush-steppe, grassland). Vegetation classes were assigned based on the assumption that historical vegetation communities would be present where the WAGs currently have disturbed communities. The areas impacted by the WAG ERA activities are shown in Figure 17-2.

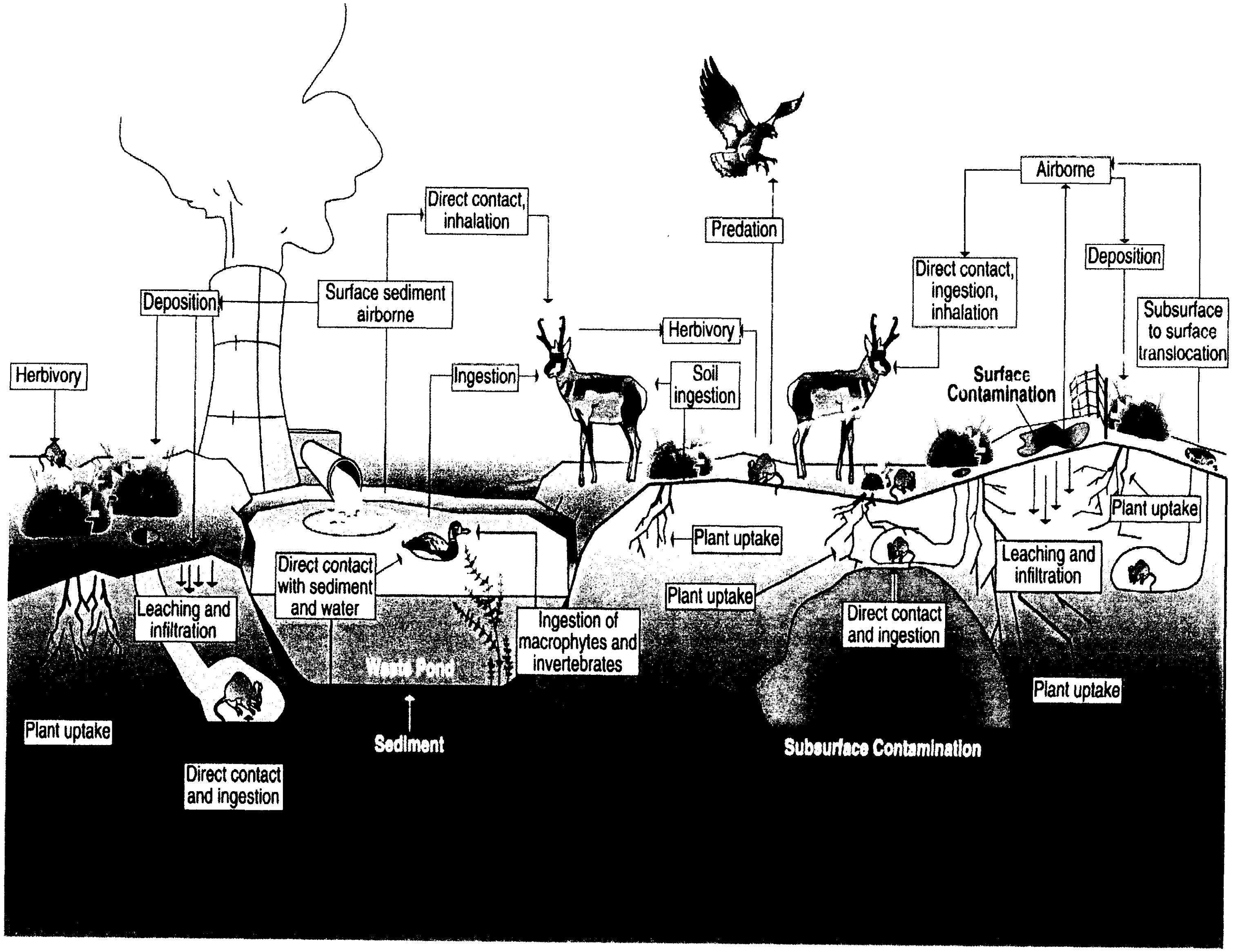

Figure 17-4. Site conceptual model.

As discussed in detail in Appendix H8, because detailed habitat models and data are not currently available for most species, vegetation class was used as a surrogate for general habitat features. The INEEL vegetation map (Kramber et al. 1992) was, therefore, used as the base dataset for OU 10-04 GIS analyses. A description of INEEL vegetation communities, including a vegetation map, can be found from Anderson et al. (1996).

The amount of habitat potentially adversely affected was determined by overlaying the delineation of contaminant spatial extent map onto the INEEL vegetation map (Figure 17-6) and evaluating the habitat composition inside the contaminant isopleths. The summary of habitats (by vegetation class) across the INEEL and within the final OU 10-04 assessment areas are presented in Table 17-12. The summary of vegetation classes associated with location/telemetry data for species of interest/receptors of concern is presented in Table 17-13.

The results of the evaluation indicate that the overall percentage of the INEEL ecological habitats impacted by the WAG contamination is less than 2% (not including roads). The ordnance sites, assessed as part of OU 10-04, were evaluated separately due to the possible wide spread presence of these sites. The primary contaminants in the ordnance areas were TNT, RDX, and their degradation products.

17.3.1.2 Analysis of Species Distribution Data at the INEEL. Distribution data sets were overlaid on the INEEL vegetation map to draw habitat associations for individual species, and the distribution data were evaluated in relation to vegetation and contaminant isopleths to determine which receptors/resources occur in or are proximate to the areas of contamination. The results of this analysis are summarized here and detailed in Appendix H8.

Species distribution data sets (described in Appendix H8) were combined with the GIS vegetation data set to identify general distribution patterns and associated sightings and/or telemetry data with primary vegetation classes. For example, GIS analyses have been conducted for six species that generally represent ecological resources, as well as T/E species and other species of concern evaluated in the ERA. They include the following:

- Mule deer
- Burrowing owl
- Ferruginous hawk
- Loggerhead shrike
- Elk
- Pygmy rabbit.

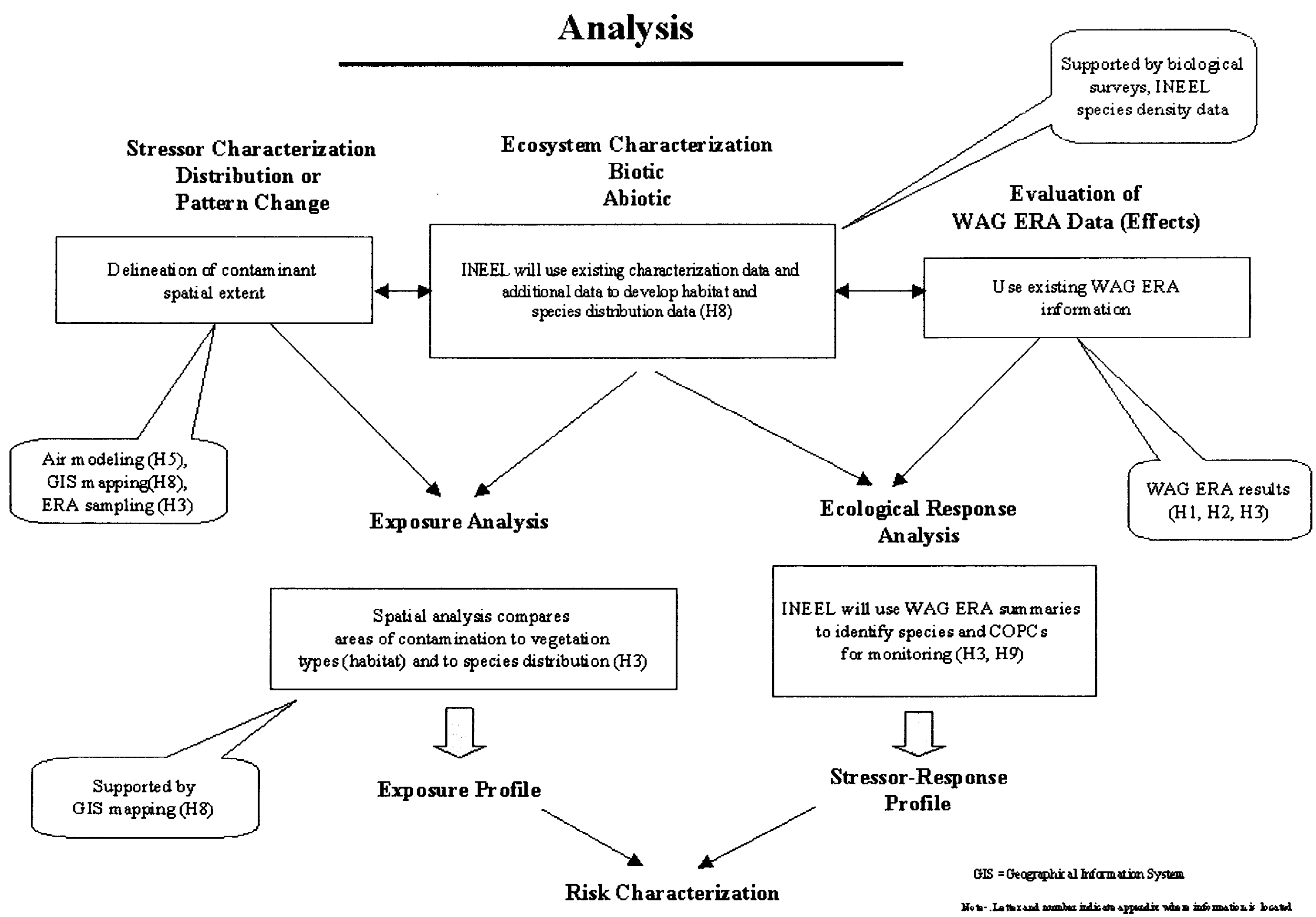

Figure 17-5. Flow diagram of the analysis phase.

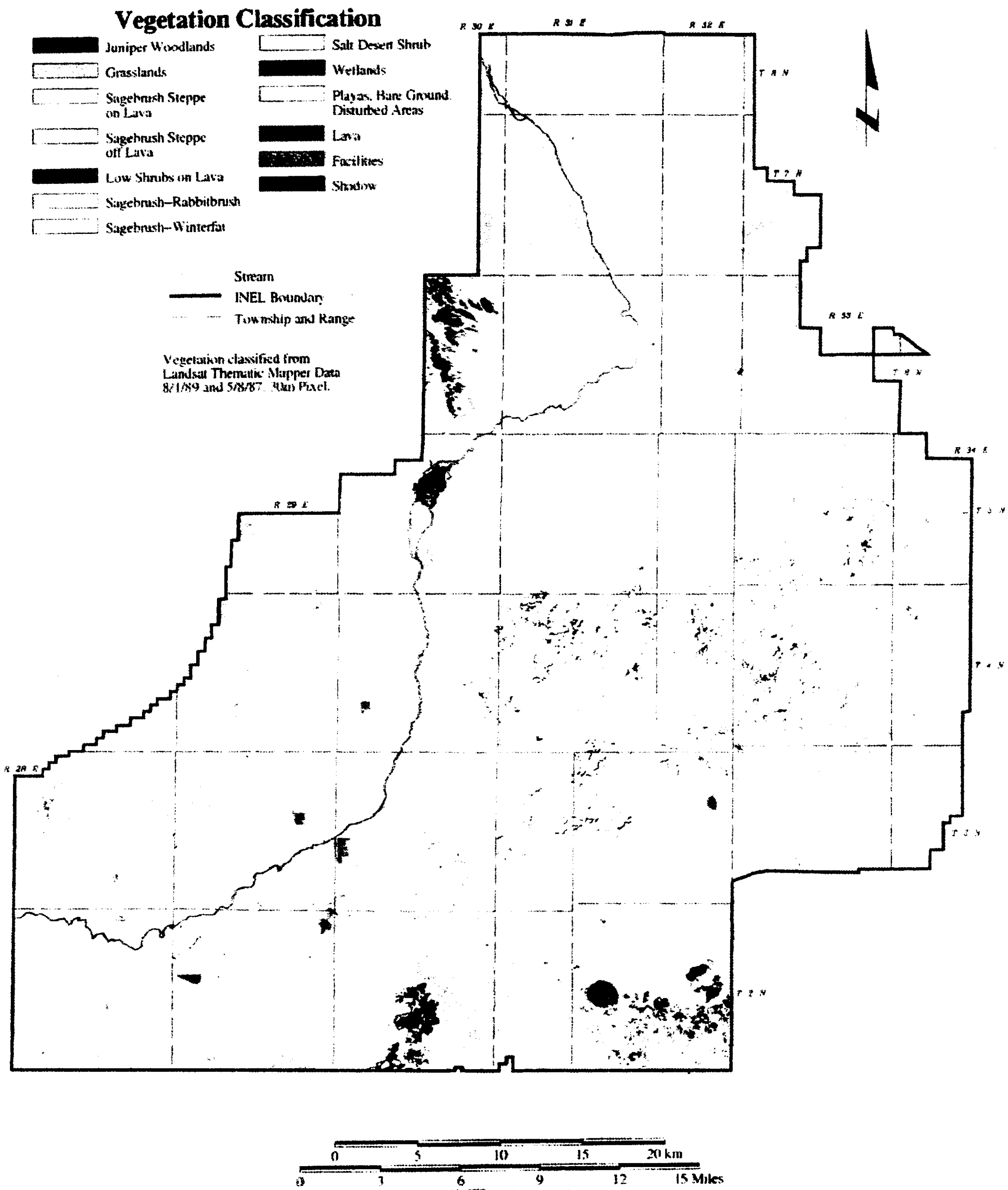

Figure 17-6. Vegetation classes on the INEEL.

Table 17-12. Analysis of INEEL vegetation classes (habitat types) potentially impacted by WAG activities.

Vegetation Class	INEEL (ha)	INEEL (%)	All WAG[a] Areas (ha)	All WAG[a] Areas (%)	Ordnance[b] Areas (ha)	Ordnance[b] Areas (%)
Juniper Woodlands	1,575.12	0.68%	0.88	0.06%	0	0
Basin Wildrye	713.1	0.31%	2.94	0.41%	0	0
Steppe	2,874.88	1.25%	42.67	1.48%	0	0
Grassland	11,106.84	4.82%	223.53	2.01%	3.33	0.03
Sagebrush-Steppe off lava	85,892.43	37.24%	1843.01	2.15%	2,860.22	3.33
Sagebrush-Steppe on Lava	90,366.28	39.18%	1802.50	2.00%	2,792.32	3.09
Sagebrush-Winterfat	9,208.03	3.99%	93.47	1.02%	16.57	0.18
Salt desert shrub	7,183.58	3.11%	81.89	1.14%	1.44	0.02
Sagebrush-rabbitbrush	14,291.96	6.20%	42.98	0.30%	5.71	0.04
Sage, low-sage, rabbitbrush on lava	1,531.13	0.66%	4.97	0.33%	0.31	0.02
Wetlands	241.02	0.10%	0.13	0.05%	0	0
Playa-bareground/ gravel-borrow pits	1,769.81	0.77%	169.29	9.57%	1.24	0.07
Lava	1,579.24	0.68%	1.68	0.11%	0.16	0.01
Old fields, disturbed areas, seedings	1,187.82	0.52%	6	0.51%	0	0
Steppe-Small Sagebrush	332.95	0.14%	1.2	0.36%	0	0
Shadow	80.26	0.03%	0	0.00%	0	0
Agricultural lands	249.92	0.11%	0	0.00%	0	0
Total facilities/ordnance areas[c]	—	—	4317.41	—	296.17	—
Totals	230,617.59	100%	4,317.41	—	5,977.47	—
% INEEL total	—	—	1.87%	—	3.0%	—

ha = hectare

a. Ordnance areas area not included, and vegetation classes are estimated within assessment area.

b. Only ordnance areas having soil contamination (e.g., RDX,TNT, and their degradation products) are included in the assessment area.

c. Total assessment area based on WAG sites and fenced areas (buildings are 433.21 ha) and are not included in the Totals.

Table 17-13. Summary of vegetation classes associated with location/telemetry data for receptors of interest.

			Number of sightings in vegetation class (% of total sightings for all vegetation classes)				
Vegetation Classes	HECTARES	% of INEEL	Loggerhead Shrikes*	Ferruginous Hawks*	Burrowing Owls*	Mule Deer	Elk
Juniper Woodlands	1,575.12	0.68	3 (2.0)	0	0	2 (0.83)	32 (5.5)
Basin Wildrye	713.10	0.31	0	0	1 (4.2)	0	0
Steppe	2,874.88	1.25	0	1 (1.2)	0	0	0
Grassland	11,106.84	4.82	5 (3.3)	1 (1.2)	0	7 (2.93)	12 (2.1)
Sagebrush-Steppe off lava	85,892.43	37.24	42 (28)	24 (28)	15 (62.5)	40 (16.7)	89 (15.3)
Sagebrush-Steppe on Lava	90,366.28	39.18	67 (44)	36 (42)	5 (20.8)	177 (74.1)	375 (64.3)
Sagebrush-Winterfat	9,208.03	3.99	10 (6.6)	8 (9.4)	1 (4.2)	0	12 (2.1)
Salt desert shrub	7,183.58	3.11	4 (2.6)	8 (9.4)	1 (4.2)	0	15 (2.6)
Sagebrush-rabbitbrush	14,291.96	6.20	4 (2.6)	4 (4.7)	1 (4.2)	2 (0.83)	27 (4.6)
Sage, low-sage, rabbitbrush on lava	1,531.13	0.66	1 (0.66)	0	0	1 (0.42)	6 (1.0)
Wetlands	241.02	0.10	0	0	0	0	0
Playa-bareground/gravel-borrow pits	1,769.81	0.77	4 (2.6)	1 (1.2)	0	1 (0.42)	12 (2.1)
Lava	1,579.24	0.68	0	0	0	4 (1.67)	0
Old fields, disturbed areas, seedings	1,187.82	0.52	4 (2.6)	1 (1.2)	0	1 (0.42)	2 (0.34)
Steppe-Small Sagebrush	332.95	0.14	1 (0.66)	1 (1.2)	0	1 (0.42)	0
Shadow/unknown	80.26	0.03	0	0	0	2 (0.83)	1 (0.17)
Agricultural lands	249.92	0.11	0	0	0	0	0
Facilities	433.21	0.19	7 (4.6)	0	0	1 (0.42)	0
TOTALS	230,617.59	100.00	152	85	24	239	583

* - sightings were made along established breeding bird survey routes.

The results of these analyses are summarized in Table 17-13. These data are limited but do provide insight into the types of evaluations needed for future ecological characterization to support the ERA. If a given species does not use microhabitats preferentially within its usual preferred habitat, then the percent of the number of sightings should equal the percent of the INEEL covered in a particular vegetation class. This may not be strictly comparable owing to the uncertainty inherent in this type of analysis. Although these data have not been statistically evaluated, from visual inspection it is appears that burrowing owls are found primarily on sagebrush-steppe off lava, while mule deer and elk are most often seen on sagebrush-steppe on lava. Ferruginous hawks apparently use other shrub areas as well as the sagebrush-steppe but do not seem to prefer grasslands or more open areas. This type of observation is used to further characterize the site for future monitoring.

17.3.2 WAG ERA Receptor Evaluation

The results of the WAG ERAs have also been incorporated to develop a preliminary list of receptors evaluated in this OU 10-04 ERA (Table 17-10). All INEEL species and trophic linkages were represented in the ERAs by 36 functional groups and 14 T/E and other species of concern that were assessed individually. A summary of the WAG ERA methodology and receptors can be found in the OU 10-04 workplace (DOE/ID 1999).

Along with expert judgment, two processes were applied to identify receptors to be evaluated in the OU 10-04 ERA:

1. Functional groups or individual species for which WAG-specific HQs exceeded 10 for any COPC at more than one WAG were retained (refer to Appendix H2)

2. The number of COPCs for which HQs for those receptors exceeded 10 was summarized as a general indicator of spatial distribution of potential risk for functional groups and species.

Section 17.2.1 summarizes the WAG ERAs presented in Appendices H1 and H2. The final list of WAG ERA sites and associated COPCs carried forward to the OU 10-04 ERA are shown in Tables 17-1 through 17-7 and summarized in Table 17-8 in the Problem Formulation section (Section 17.1). The functional groups or individual receptors evaluated at the WAG level are evaluated in this section in order to focus the OU 10-04 ERA on those COPCs likely to pose a risk, and those receptors most likely to be affected, site-wide. This effort will be used to evaluate receptors and COPCs to retain for future monitoring.

Tables 17-14 through 17-24 show the receptors by functional group with HQs in excess of 10 by WAG for nonradionuclides. These tables are further summarized and discussed in the risk characterization (Section 17-4).

17.3.3 Analysis of the 1997 OU 10-04 ERA Sampling

Abiotic and biotic data collected in 1997 were evaluated and are discussed in detail in Appendix H3. One of the goals of the 1997 sampling event was to verify the food web modeling used for the WAG ERAs. This was accomplished by comparing a limited number of bioaccumulation factors (BAFs) calculated from site-specific biota and co-located soil data to literature BAFs. The acronym PUF has also been used in context of the WAG ERAs to identify soil-to-plant uptake factors. This BAF (and PUF) evaluation is presented in Appendix H3, and a summary table is provided in this section (Table 17-25). The results of this evaluation indicate that for the analytes where comparisons could be made, the use of literature BAFs was sufficiently conservative, and risks associated with the dietary ingestion pathways were generally overestimated.

17.4 Risk Characterization

Risk characterization is the final phase of the ERA process (EPA 1998). The risk characterization clarifies the relationships between stressors, effects, and ecological entities, and uses the results of the analysis to develop an estimate of the risk. There are generally three main components of the risk characterization phase of an ERA including (1) risk estimation, (2) risk description, and (3) an uncertainty analysis. Figure 17-7 provides a flow diagram of the risk characterization phase as it applies to the OU 10-04 ERA.

Since the OU 10-04 ERA has a large amount of information compiled, a lines of evidence approach is used to support the risk conclusions. A conclusions and recommendations section (Section 17-4.5) summarizes the results of these efforts and discusses their implications at the OU 10-04 level. This final section is centered on focusing the results on assessing whether remediation efforts are warranted, but primarily to support the long-term ecological monitoring and stewardship efforts that will be implemented at the INEEL.

17.4.1 Risk Estimation

The risk estimation determines the likelihood of adverse effects by integrating the analysis results with the assessment endpoints (i.e., ecological receptors). The risk estimation will discuss the results of the WAG ERA summaries, the spatial analysis, and the OU 10-04 ERA sampling data. Table 17-26 presents a summary of the ecological receptors associated with assessment endpoints and risk assessment conclusions. This information was compiled from the results presented below.

The OU 10-04 ERA sampling data were also evaluated, and a sensitivity study on the site-specific and literature uptake factors was performed in Appendix H3 to evaluate the food web modeling used in the ERA. This information will be discussed as it supports the risk assessment.

Most of the contaminants of concern at the OU 10-04 level are metals and are not bioaccumlators in the terrestrial environment. Selenium and mercury may be two of the exceptions. Selenium is a risk to plants and the pygmy rabbit (at 1 out of 8 WAGs); avian omnivores (at 2 out of 8 WAGs); avian insectivores, mammalian omnivores, and mammalian herbivores (at 4 out of 8 WAGs); and mammalian insectivores(at 6 out of 8 WAGs). Mercury is a concern for all receptors at all WAGs but is also not expected to significantly bioaccumulate in terrestrial environments. The organic contaminants associated with the TNT and RDX and their degradation products may bioaccumulate to some degree. However, this cannot be assessed at this time due to the lack of supporting field sampling data.

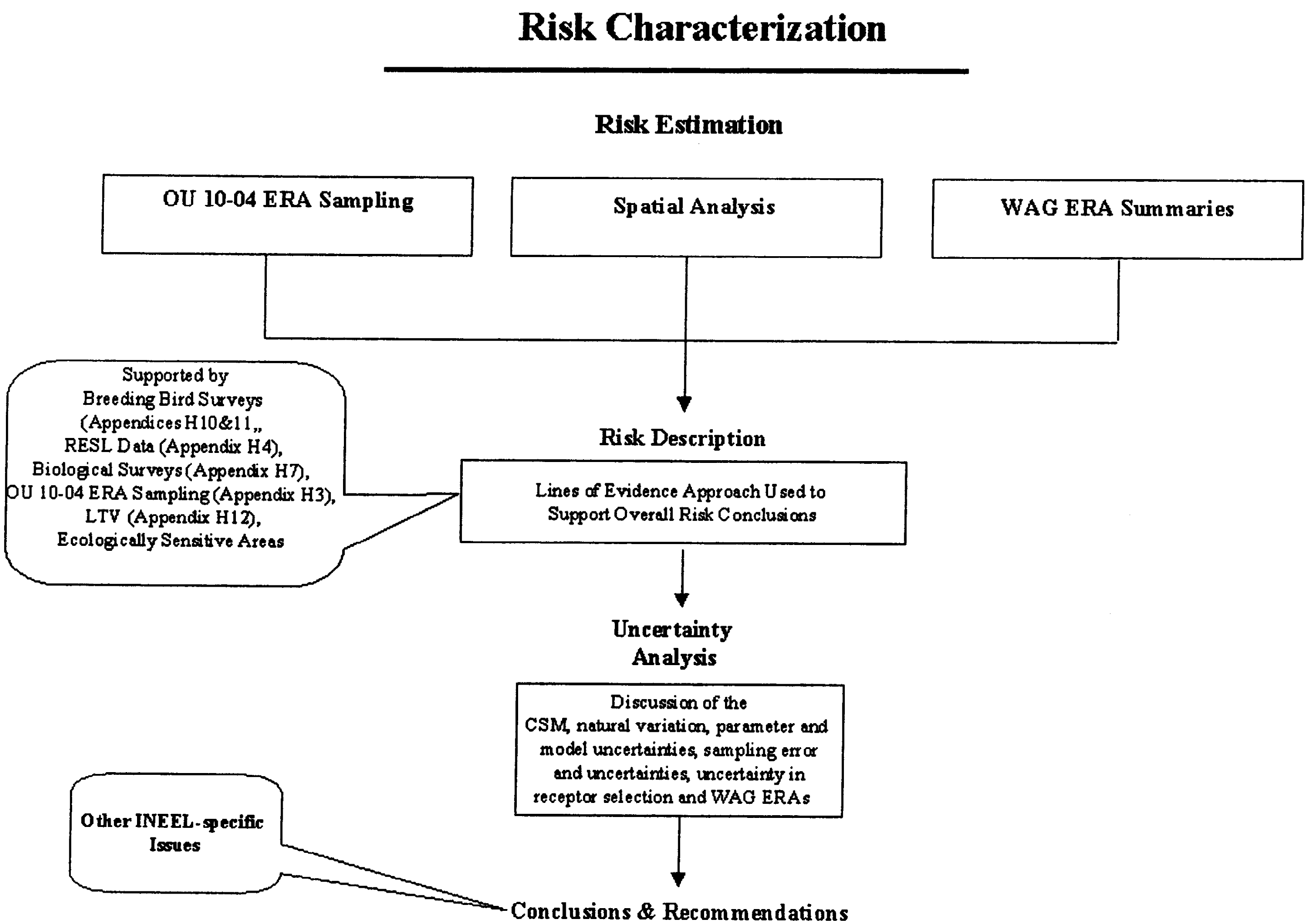

Figure 17-7. Risk characterization flow diagram.

Table 17-14. Summary of potential exposures from OU 10-04 COPCs to pygmy rabbits where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH	X	—	—	X	—	—	—	—	X
1,3-Dintrobenzene	—	—	—	—	—	—	—	—	X
2,4-Dinitrotoluene	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene	X	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene	—	—	—	—	—	—	—	—	X
RDX	—	—	—	—	—	—	—	—	X
Xylene	—	—	—	X	—	—	—	—	
Arsenic	—	—	—	—	—	—	—	—	—
Antimony	—	—	—	—	—	—	—	—	—
Barium	X	X	X	X	—	—	—	X	—
Cadmium	X	X	X	X	X	X	—	X	X
Chromium III	—	—	—	—	—	—	—	—	—
Chromium VI	X	—	—	X	X	—	—	X	—
Cobalt	X	—	—	—	—	—	—	—	—
Copper	X	—	—	X	X	—	—	X	—
Cyanide	—	—	—	—	—	—	—	—	—
Lead	—	—	—	—	—	—	—	—	X
Manganese	—	—	—	—	—	X	—	X	X
Mercury	X	X	X	X	X	X	—	X	—
Nickel	—	—	—	—	—	—	—	—	—
Selenium	—	—	—	—	—	—	—	X	—
Silver	X	—	—	—	—	—	—	—	—
Strontium	—	—	—	—	—	—	—	—	—
Thallium	—	—	—	—	—	—	—	—	—
Vanadium	—	—	—	—	—	—	—	—	—
Zinc	X	X	—	X	X	—	—	X	—
Total COPC/WAG	10	4	3	8	5	3	0	8	7

Table 17-15. Summary of potential exposures from OU 10-04 COPCs to mammalian insectivores (including Townsend's big-eared bat, long-eared myotis, small-footed myotis) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH	X	—	—	X	—	—	—	—	—
1,3-Dintrobenzene	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene	X	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene	—	—	—	—	—	—	—	—	—
RDX	—	—	—	—	—	—	—	—	—
Xylene	—	—	—	X	—	—	—	—	—
Arsenic	X	X	X	X	X	—	—	X	—
Antimony	X	X	—	—	X	—	—	X	—
Barium	X	X	X	X	—	—	—	X	X
Cadmium	X	X	X	X	X	—	—	X	X
Chromium III	—	—	—	—	—	—	—	—	—
Chromium VI	X	—	X	X	X	—	—	X	—
Cobalt	X	—	—	—	X	—	—	—	—
Copper	X	X	—	X	X	—	—	X	X
Cyanide	—	—	—	—	—	—	—	—	—
Lead	X	X	—	—	—	—	—	—	X
Manganese	X	—	—	—	—	—	—	X	—
Mercury	X	X	X	X	X	—	—	X	—
Nickel	X	—	X	X	X	—	—	X	—
Selenium	X	X	X	X	X	—	—	X	—
Silver	X	X	—	—	X	—	—	X	—
Strontium	—	—	—	—	—	—	—	—	—
Thallium	X	X	—	—	X	—	—	—	—
Vanadium	X	X	—	—	X	—	—	X	—
Zinc	X	X	—	X	X	—	—	X	—
Total COPC/WAG	16	12	7	9	13	0	0	13	4

Table 17-16. Summary of potential exposures from OU 10-04 COPCs to avian herbivores (including the mourning dove) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH-*	—	—	—	—	—	—	—	—	—
1,3-Dintrobenzene*	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene*	—	—	—	—	—	—	—	—	—
2-Methynaphthalene*	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene*	—	—	—	—	—	—	—	—	—
RDX*	—	—	—	—	—	—	—	—	—
Xylene*	—	—	—	—	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony*	—	—	—	—	—	—	—	—	—
Barium*	—	—	—	—	—	—	—	—	—
Cadmium	X	X	—	—	—	—	—	X	—
Chromium III	—	—	—	—	—	—	—	X	—
Chromium VI*	—	—	—	—	—	—	—	—	—
Cobalt	—	—	—	—	—	—	—	—	X
Copper	—	—	—	—	—	—	—	—	—
Cyanide	—	—	—	—	—	—	—	—	—
Lead	X	X	—	—	X	—	—	X	X
Manganese	—	—	—	—	—	—	—	—	—
Mercury	X	X	X	X	X	—	—	X	—
Nickel	—	—	—	—	—	—	—	—	—
Selenium	—	—	—	—	—	—	—	—	—
Silver	—	—	—	—	—	—	—	—	—
Strontium*	—	—	—	—	—	—	—	—	—
Thallium	—	—	—	—	—	—	—	—	—
Vanadium	—	—	—	—	—	—	—	—	—
Zinc	X	—	—	—	—	—	—	X	—
Total COPC/WAG	4	3	1	1	2	0	0	5	2

*. No toxicity values available for avian species.

Table 17-17. Summary of potential exposures from OU 10-04 COPCs to avian omnivores (including the magpie) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH*	—	—	—	—	—	—	—	—	—
1,3-Dintrobenzene*	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene*	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene*	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene*	—	—	—	—	—	—	—	—	—
RDX*	—	—	—	—	—	—	—	—	—
Xylene*	—	—	—	—	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony*	—	—	—	—	—	—	—	—	—
Barium*	—	—	—	—	—	—	—	—	—
Cadmium	—	—	—	—	—	—	—	—	—
Chromium III	—	—	—	—	—	—	—	x	—
Chromium VI*	—	—	—	—	—	—	—	—	—
Cobalt	—	—	—	—	—	—	—	—	x
Copper	—	—	—	—	—	—	—	—	—
Cyanide	—	—	—	—	—	—	—	x	—
Lead	x	x	—	—	x	—	—	—	x
Manganese	—	—	—	—	—	—	—	—	—
Mercury	x	—	—	—	—	—	—	—	—
Nickel	—	—	—	—	—	—	—	—	—
Selenium	x	x	—	—	—	—	—	x	—
Silver	—	—	—	—	—	—	—	—	—
Strontium*	—	—	—	—	—	—	—	—	—
Thallium	—	—	—	—	—	—	—	—	—
Vanadium	—	—	—	—	—	—	—	—	—
Zinc	x	—	—	—	—	—	—	x	—
Total COPC/WAG	4	2	0	0	1	0	0	4	2

*. No toxicity value available for avian species.

Table 17-18. Summary of potential exposures from OU 10-04 COPCs to avian insectivores (including the sage sparrow) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH-diesel*	—	—	—	—	—	—	—	—	—
1,3-Dintrobenzene*	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene*	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene*	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene*	—	—	—	—	—	—	—	—	—
RDX*	—	—	—	—	—	—	—	—	—
Xylene*	—	—	—	—	—	—	—	—	—
—	x	x	—			—	—	x	—
Antimony*	—	—	—	—	—	—	—	—	—
Barium*	—	—	—	—	—	—	—	—	—
Cadmium	x	x	—	X	x	—	—	x	—
Chromium III	—	—	—		—	—	—	x	—
Chromium VI*	—	—	—	—	—	—	—	—	—
Cobalt	x	—	—	—	x	—	—	—	—
Copper	x	—	—		x	—	—	x	—
Cyanide	x	—	—	—	—	—	—	x	—
Lead	X	x	x	x	x	—	—	x	x
Manganese	—	—	—	—	—	—	—	—	—
Mercury	X	x	x	X	—	—	—	—	—
Nickel	—	—	—	x	—	—	—	x	—
Selenium	X	x	—		x	—	—	x	—
Silver	—	—	—	x	—	—	—	—	—
Strontium*	—	—	—	—	—	—	—	—	—
Thallium	X	x	—	—	x	—	—	—	—
Vanadium	X	x	—	—	x	—	—	x	—
Zinc	X	x	—	x	x	—	—	x	—
Total COPC/WAG	11	8	2	6	8	0	0	10	1

*. No toxicity value available for avian species.

Table 17-19. Summary of potential exposures to INEEL plant communities from OU 10-04 COPCs where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH*	—	—	—	—	—	—	—	—	—
1,3-Dintrobenzene*	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene*	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene*	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene*	—	—	—	—	—	—	—	—	—
RDX*	—	—	—	—	—	—	—	—	—
Xylene*	—	—	—	—	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony	—	—	—	—	—	—	—	X	—
Barium	—	—	—	—	—	—	—	—	—
Cadmium	—	—	X	—	—	—	—	—	—
Chromium III	X	X	X	—	—	—	—	X	—
Chromium VI	X	—	X	—	—	—	—	X	—
Cobalt*	—	—	—	—	—	—	—	X**	—
Copper	X	—	—	—	—	—	—	—	—
Cyanide*	—	—	—	—	—	—	—	—	—
Lead	X	—	—	—	—	—	—	—	—
Manganese	—	—	—	—	—	—	—	—	—
Mercury	X	X	X	X	—	—	—	X	—
Nickel	—	—	—	—	—	—	—	—	—
Selenium	—	X	—	—		—	—	—	—
Silver	X	X	—	X	X	—	—	X	—
Strontium*	—	—	—	—	—	—	—	—	—
Thallium	X	X	—	—	—	—	—	—	—
Vanadium	—	—	—	—	—	—	—	—	—
Zinc	—	—	—	—	—	—	—	X	X
Total COPC/WAG	7	5	4	2	1	0	0	7	1

*. No plant toxicity value available.

**WAG 9 used a toxicity value for plants.

Table 17-20. Summary of potential exposures from OU 10-04 COPCs to mammalian carnivores (including the coyote) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH	—	—	—	—	—	—	—	—	—
1,3-Dintrobenzene	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene	—	—	—	—	—	—	—	—	—
RDX	—	—	—	—	—	—	—	—	—
Xylene	—	—	—	—	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony	—	—	—	—	—	—	—	—	—
Barium	X	X	—	X	—	—	—	X	—
Cadmium	X	X	—	X	X	—	—	X	—
Chromium III	—	—	—	—	—	—	—	—	—
Chromium VI	—	—	—	—	X	—	—	X	—
Cobalt	—	—	—	—	—	—	—	—	—
Copper	—	—	—	—	—	—	—	—	—
Cyanide	—	—	—	—	—	—	—	—	—
Lead	—	—	—	—	—	—	—	—	—
Manganese	—	—	—	—	—	—	—	—	—
Mercury	X	X	—	X	—	—	—	—	—
Nickel	—	—	—	—	—	—	—	—	—
Selenium	—	—	—	—	—	—	—	—	—
Silver	—	—	—	—	—	—	—	—	—
Strontium	—	—	—	—	—	—	—	—	—
Thallium	—	—	—	—	—	—	—	—	—
Vanadium	—	—	—	—	—	—	—	—	—
Zinc	—	—	—	—	—	—	—	—	—
Total COPC/WAG	3	3	0	3	2	0	0	3	0

Table 17-21. Summary of potential exposures from OU 10-04 COPCs to mammalian omnivores (including the deer mouse) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH	X	—	—	—	—	—	—	—	—
1,3-Dintrobenzene	—	—	—	—	—	—	—	—	X
2,4-Dinitrotoluene	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene	—	—	—	—	—	—	—	—	X
RDX	—	—	—	—	—	—	—	—	X
Xylene	—	X	—	X	—	—	—	—	—
Arsenic	X	X	—	—	—	—	—	X	—
Antimony	X	—	—	—	—	—	—	—	—
Barium	X	X	X	X	—	—	—	X	X
Cadmium	X	X	X	X	X	—	—	X	X
Chromium III	—	—	—	—	—	—	—	—	—
Chromium VI	X	—	—	X	X	—	—	X	—
Cobalt	X	—	—	—	—	—	—	—	—
Copper	X	X	—	X	X	—	—	X	X
Cyanide	—	—	—	—	—	—	—	—	—
Lead	X	—	—	—	—	—	—	—	X
Manganese	—	—	—	—	—	—	—	X	—
Mercury	X	X	X	X	X	—	—	X	—
Nickel	X	—	—	X	—	—	—	X	—
Selenium	X	X	—	—	X	—	—	X	—
Silver	X	—	—	—	—	—	—	X	—
Strontium	—	—	—	—	—	—	—	—	—
Thallium	X	—	—	—	X	—	—	—	—
Vanadium	X	—	—	—	X	—	—	X	—
Zinc	X	—	—	—	—	—	—	X	—
Total COPC/WAG	16	7	3	7	7	0	0	12	7

Table 17-22. Summary of potential exposures from OU 10-04 COPCs to mammalian herbivores (including the mule deer) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH	X	—	—	X	—	—	—	—	—
1,3-Dintrobenzene	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene	—	—	—	—	—	—	—	—	—
RDX	—	—	—	—	—	—	—	—	X
Xylene	—	—	—	X—	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony	—	—	—	—	—	—	—	—	—
Barium	X	X	X	X	—	—	—	X	—
Cadmium	X	X	X	X	X	—	—	X	X
Chromium III	—	—	—	—	—	—	—	—	—
Chromium VI	X	—	—	X	X	—	—	X	—
Cobalt	X	—	—	—	X	—	—	—	—
Copper	X	X	—	X	X	—	—	X	—
Cyanide	—	—	—	—	—	—	—	—	—
Lead	X	—	—	X	—	—	—	—	—
Manganese	X	—	—	—	—	—	—	X	—
Mercury	X	X	X	X	X	—	—	X	—
Nickel	—	—	—	X	—	—	—	—	—
Selenium	X	X	—	—	X	—	—	X	—
Silver	X	—	—	—	X	—	—	X	—
Strontium	—	—	—	—	—	—	—	—	—
Thallium	X	—	—	—	X	—	—	—	—
Vanadium	—	—	—	—	X	—	—	—	—
Zinc	X	X	—	X	X	—	—	X	—
Total COPC/WAG	13	6	3	10	10	0	0	9	1

Table 17-23. Summary of potential exposures from OU 10-04 COPCs to avian carnivores (including the ferruginous hawk, peregrine falcon and bald eagle) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH*	—	—	—	—	—	—	—	—	—
1,3-Dintrobenzene*	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene*	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene*	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene*	—	—	—	—	—	—	—	—	—
RDX*	—	—	—	—	—	—	—	—	—
Xylene*	—	—	—	—	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony*	—	—	—	—	—	—	—	—	—
Barium*	—	—	—	—	—	—	—	—	—
Cadmium	X	X	—	—	X	—	—	X	—
Chromium III	—	—	—	—	—	—	—	X	—
Chromium VI*	—	—	—	—	—	—	—	—	—
Cobalt	—	—	—	—	—	—	—	—	—
Copper	—	—	—	—	—	—	—	—	—
Cyanide	—	—	—	—	—	—	—	X	—
Lead	X	X	—	X	X	—	—	X	—
Manganese	—	—	—	—	—	—	—	—	—
Mercury	X	—	—	—	—	—	—	—	—
Nickel	—	—	—	—	—	—	—	—	—
Selenium	—	—	—	—	—	—	—	—	—
Silver	—	—	—	—	—	—	—	—	—
Strontium*	—	—	—	—	—	—	—	—	—
Thallium	—	—	—	—	—	—	—	—	—
Vanadium	—	—	—	—	—	—	—	—	—
Zinc	X	—	—	—	—	—	—	X	—
Total COPC/WAG	4	2	0	1	2	0	0	5	

* No toxicity values for avian receptors.

Table 17-25. Evaluation of site-specific bioaccumulation factors (BAFs) relative to literature-derived BAFs.

Compound	BAF type	CPP Minimum BAF	CPP Maximum BAF	CPP Mean BAF	RSA Minimum BAF	RSA Maximum BAF	RSA Mean BAF	Literature BAF	Is Literature BAF Higher or Lower than Site-specific BAF?
Aluminum	soil_dm	0.012	0.020	0.016	0.004	0.021	0.012	NE	NA
Arsenic	soil_wgrass	0.020	0.036	0.029	0.023	0.032	0.026	0.04	+
Arsenic	soil_btl	0.117	0.183	0.153	0.083	0.124	0.101	1	+
Arsenic	soil_ghopp	0.052	0.097	0.068	0.051	0.098	0.070	1	+
Barium	soil_sbrush	0.021	0.037	0.027	0.021	0.025	0.023	0.15	+
Barium	soil_rabbit	0.020	0.085	0.043	0.026	0.055	0.035	0.15 or 1	+
Barium	soil_wgrass	0.039	0.192	0.089	0.042	0.070	0.056	0.15	+ except for CPP Max value
Barium	soil_dm	0.020	0.029	0.024	0.013	0.020	0.017	0.15 or 1	+
Barium	soil_btl	0.032	0.081	0.049	0.029	0.049	0.038	1	+
Beryllium	soil_ghopp	0.013	0.045	0.021	0.014	0.036	0.024	1	+
Boron	soil_wgrass	0.413	0.694	0.515	0.537	0.779	0.610	1	+
Boron	soil_sbrush	1.815	2.406	2.096	1.110	2.263	1.786	1	-
Boron	soil_ghopp	0.219	0.457	0.291	0.129	0.257	0.160	1	+
Boron	soil_btl	0.554	1.177	0.761	0.214	0.326	0.281	1	+
Chromium	soil_dm	0.030	0.084	0.055	0.017	0.031	0.024	0.06, 0.2, 1	varies but mainly +
Chromium	soil_rabbit	0.012	0.055	0.024	0.015	0.025	0.018	0.06, 0.2, 1	varies but mainly +
Chromium	soil_sbrush	0.014	0.025	0.020	0.012	0.017	0.014	0.19	+
Chromium	soil_wgrass	0.073	0.200	0.118	0.159	0.195	0.168	0.19	very similar
Chromium	soil_ghopp	0.035	0.069	0.049	0.049	0.143	0.097	1	+
Chromium	soil_btl	0.065	0.122	0.089	0.097	0.165	0.136	1	+
Cobalt	soil_btl	0.021	0.038	0.030	0.025	0.046	0.039	1	+
Copper	soil_rabbit	0.080	0.132	0.112	0.088	0.129	0.107	0.2, 1	+
Copper	soil_sbrush	0.275	0.613	0.427	0.303	0.444	0.365	0.8	+

Table 17-25. (continued).

Compound	BAF type	CPP Minimum BAF	CPP Maximum BAF	CPP Mean BAF	RSA Minimum BAF	RSA Maximum BAF	RSA Mean BAF	Literature BAF	Is Literature BAF Higher or Lower than Site-specific BAF?
Copper	soil_dm	0.151	0.280	0.187	0.169	0.265	0.217	0.2, 1	very similar
Copper	soil_ghopp	0.946	1.924	1.427	1.000	1.429	1.238	1	-
Copper	soil_btl	0.360	0.639	0.477	0.484	0.639	0.558	1	+
Lead	soil_rabbit	0.008	0.044	0.022	0.004	0.010	0.006	0.3, 0.6, 1	+
Lead	soil_sbrush	0.008	0.017	0.012	0.009	0.016	0.012	0.02	+
Lead	soil_ghopp	0.018	0.030	0.022	0.020	0.041	0.026	1	+
Manganese	soil_rabbit	0.007	0.030	0.018	0.006	0.012	0.009	0.25	+
Manganese	soil_sbrush	0.045	0.078	0.060	0.039	0.048	0.045	9.8	+
Manganese	soil_dm	0.013	0.022	0.017	0.008	0.014	0.010	0.25	+
Manganese	soil_wgrass	0.045	0.113	0.075	0.048	0.072	0.060	9.8	+
Manganese	soil_ghopp	0.024	0.049	0.033	0.023	0.032	0.027	1	+
Manganese	soil_btl	0.031	0.086	0.054	0.035	0.061	0.046	1	+
Mercury	soil_btl	0.500	1.000	0.700	0.500	1.333	1.011	1	very similar
Nickel	soil_rabbit	0.009	0.039	0.017	0.011	0.019	0.013	0.006, 1	similar
Nickel	soil_wgrass	0.025	0.071	0.045	0.058	0.083	0.067	0.06	similar to just below
Nickel	soil_dm	0.031	0.066	0.047	0.020	0.077	0.034	0.006, 1	-
Nickel	soil_ghopp	0.020	0.039	0.028	0.022	0.051	0.035	1	+
Nickel	soil_btl	0.013	0.056	0.037	0.018	0.060	0.047	1	+
Strontium	soil_wgrass	0.118	0.249	0.174	0.099	0.179	0.132	1	+
Strontium	soil_sbrush	0.169	0.312	0.214	0.100	0.230	0.165	1	+
Strontium	soil_ghopp	0.050	0.088	0.068	0.023	0.047	0.037	1	+
Strontium	soil_btl	0.081	0.144	0.107	0.052	0.102	0.076	1	+
Vanadium	soil_sbrush	0.006	0.014	0.010	0.002	0.008	0.006	0.0055	similar but some are -
Vanadium	soil_dm	0.013	0.027	0.018	0.005	0.007	0.007	0.0055, 1	similar but some are -
Vanadium	soil_ghopp	0.029	0.047	0.037	0.032	0.049	0.041	1	+

Table 17-25. (continued).

Compound	BAF type	CPP Minimum BAF	CPP Maximum BAF	CPP Mean BAF	RSA Minimum BAF	RSA Maximum BAF	RSA Mean BAF	Literature BAF	Is Literature BAF Higher or Lower than Site-specific BAF?
Vanadium	soil_btl	0.018	0.034	0.027	0.035	0.063	0.047	1	+
Zinc	soil_sbrush	0.119	0.226	0.167	0.172	0.310	0.220	1.5	+
Zinc	soil_wgrass	0.089	0.256	0.157	0.115	0.180	0.148	1.5	+
Zinc	soil_rabbit	0.291	0.787	0.439	0.600	0.964	0.845	0.7, 1	similar
Zinc	soil_dm	0.299	0.637	0.469	0.396	1.285	0.733	0.7, 1	similar
Zinc	soil_ghopp	0.416	0.821	0.572	0.593	1.146	0.831	1	similar
Zinc	soil_btl	0.264	0.454	0.354	0.378	0.608	0.484	1	+

NE = not evaluated; NA = not applicable

soil_dm - BAF calculated by dividing deer mouse tissue concentration by soil concentration.

soil_wgrass - BAF calculated by dividing wheatgrass tissue concentration by soil concentration.

soil_btl - BAF calculated by dividing beetle tissue concentration by soil concentration.

soil_ghopp - BAF calculated by dividing grasshopper tissue concentration by soil concentration.

soil_sbrush - BAF calculated by dividing sagebrush tissue concentration by soil concentration.

soil_rabbit - BAF calculated by dividing cottontail rabbit tissue concentration by soil concentration.

Notes-. BAFs were calculated for each co-located soil and biota sample for both offsite (reference study area (RSA), and onsite (CPP Plume) ecological study areas

Multiple literature BAFs listed reflect different values for different receptors and functional groups

BAFs are unitless

'+ = higher

'- = lower

Default BAF used for OU 10-04 and WAG ERAs was 1 if no literature value available.

Table 17-26. Ecological Receptors Associated with Assessment Endpoints and Risk Assessment Conclusions.

Ecological Receptor	Functional Groups Represented	Assessment Endpoint No. from Appendix H6	Results of the 1997 OU 10-04 ERA sampling (INTEC area only)	Results of WAG ERAs
Plants	All vegetation	1	For the limited area encompassed by the 1997 CPP sampling, risks to plants are negligible due to metals and radionuclides and are less than or equal to the RSA or INEEL background	Risks to plants (Based on maximum HQs >10) due to: • Antimony—WAG 9 • Cadmium—WAG 3 • Chromium III —WAGs 1,2,3,9 • Chromium VI —WAGs 1,4, 9 • Cobalt—WAG 9 • Copper and lead—WAG 1 • Mercury - WAGs 1,2,3,4,9 • Selenium—WAG 2 • Silver - WAG 1,2,4,5,9 • Thallium—WAG 2,3 • Zinc —WAG 9,6/10 (Burn Ring) Risks could not be assessed due to lack of TRVs for the following inorganic COPCs (TRVs may have been developed for later WAG ERAs): • Cobalt • Sulfide in sediment at CPP 67 in WAG 3 (Percolation Ponds #1 and #2) • Cyanide at WAGs 1,3,9 • Sulfate • Nitrate and nitrite For WAGs 6 & 10 sites, risks could not be assessed due to lack of TRVs for the following organic COPCs: • HMX • Xylene • Pentachlorophenol • RDX • Tetryl • TPH • Benzo(g,h,i)perylene • Bis-2-ethylhexyl phthalate

Table 17-26. (continued).

Ecological Receptor	Functional Groups Represented	Assessment Endpoint No. from Appendix H6	Results of the 1997 OU 10-04 ERA sampling (INTEC area only)	Results of WAG ERAs
Grasshoppers, beetles	Terrestrial invertebrates	2,6	Risks from direct soil were not evaluated for the OU 10-04 ERA	Risks due to direct contact with the soil were not evaluated in WAG ERAs.
Great Basin spadefoot toad	Amphibian (A232)	3,4	Risk to amphibians were not evaluated in the OU 10-04 ERA	Risk to amphibians were not evaluated in the WAG ERAs.
Sagebrush lizard	Reptilian insectivores (R222)	3	Risk to reptiles were not evaluated in the OU 10-04 ERA	Risk to reptiles were not evaluated in the WAG ERAs.
Pygmy rabbit	Mammalian herbivore (M122A)	3,5	For the limited area encompassed by the 1997 CPP sampling, risks to small herbivorous mammals are negligible due to metals and radionuclides and are less than or equal to the RSA or INEEL background	Risks to mammalian herbivores (pygmy rabbit) (Based on maximum HQs >10) due to: • Barium—WAGs 1,2,3,4,9 • Cadmium—WAGs 1,2,4,5,9, 6/10(Borax-01, NODA #2) • Chromium VI—WAGs 1,4,5,9 • Copper—WAGs 1,4,5,9 • Mercury—WAGs 1,2,3,4,5,9 • Selenium—WAG 9 • Zinc—WAGs 1,2,4,5,9 • RDX—CFA-633, NODA #2 • 1,3-Dinitrobenzene—WAG 6/10(Field Station #1, NOAA #6) • 2,4,6-Trinitrotoluene—WAG 6/10 (Field Station #1, Mine Fuze #3, NOAA #2a, NOAA #3, NOAA #6) • TPH—WAG 6/10 (NODA #4) Risks could not be assessed due to lack of TRVs for the following inorganic COPCs: Sulfide in sediment at CPP 67 in WAG 3 (Percolation Ponds #1 and #2)

Table 17-26. (continued).

Ecological Receptor	Functional Groups Represented	Assessment Endpoint No. from Appendix H6	Results of the 1997 OU 10-04 ERA sampling (INTEC area only)	Results of WAG ERAs
Deer mouse	Mammalian omnivores (M422)	3,6	For the limited area encompassed by the 1997 CPP sampling, risks to small omnivorous mammals are negligible due to metals and radionuclides and are less than or equal to the RSA or INEEL background	• Risks to mammalian omnivores (deer mouse) (Based on maximum HQs >10) due to:Antimony—WAGs 1 • Arsenic—WAGs 1,2,9 • Barium—WAGs 1,2,3,4,9,6/10 • Cadmium—WAGs 1,2,4,5,9,6/10(Borax-01, NODA #2) • Chromium VI—WAGs 1,4,5,9 • Cobalt—WAGs 1 • Copper—WAGs 1,2,4,5,9,6/10 • Lead—WAG 1,6/10(STF-02 Berm) • Manganese—WAGs 9 • Mercury—WAGs 1,2,3,4,5,9 • Nickel—WAGs 1,4,9 • Selenium—WAGs 1,2,5,9 • Silver—WAG 1 • Thallium—WAG 1,5 • Vanadium—WAGs 1,4,9 • Zinc—WAG 1,9 • 1,3-Dinitrobenzene—WAG 6/10 (NOAA #6) • RDX—WAG 6/10 (NODA #2) • 2,4,6-Trinitrotoluene—WAG 6/10 (Field Station #1, Mine Fuze #3, NOAA #2a, NOAA #3, NOAA #6) • Xylene—WAGs 2,4 Risks could not be assessed due to lack of TRVs for the following inorganic COPCs: • Sulfide in sediment at CPP 67 in WAG 3 (Percolation Ponds #1 and #2)

Table 17-26. (continued).

Ecological Receptor	Functional Groups Represented	Assessment Endpoint No. from Appendix H6	Results of the 1997 OU 10-04 ERA sampling (INTEC area only)	Results of WAG ERAs
Mule deer	Mammalian herbivores (M122)	3,5	For the limited area encompassed by the 1997 CPP sampling, risks to herbivorous mammals are negligible due to metals and radionuclides and are less than or equal to the RSA or INEEL background	Risks to mammalian herbivores (mule deer) (Based on maximum HQs >10) due to: • Barium—WAGs 1,2,3,4,9 • Cadmium—WAGs 1,2,3,4,5,9,6/10 • Chromium VI—WAGs 1,4,5,9 • Cobalt—WAGs 1,5 • Copper—WAGs 1,2,4,5,9 • Lead—WAGs 1,4,9 • Manganese—WAGs 1,9 • Mercury—WAGs 1,2,3,4,5,9 • Nickel—WAGs 4 • Selenium—WAGs 1,2,5,9 • Silver—WAG 1 • Thallium—WAGs 1,5 • Vanadium—WAG 5 • Zinc—WAG 1,2,4,5,9 • RDX—WAG 6/10(NODA #2) • Xylene—WAG 4 Risks could not be assessed due to lack of TRVs for the following inorganic COPCs: • Sulfide in sediment at CPP 67 in WAG 3 (Percolation Ponds #1 and #2) •
Coyote	Mammalian carnivores (M322)	3	For the limited area encompassed by the 1997 CPP sampling, risks to carnivorous mammals are negligible due to metals and radionuclides and are less than or equal to the RSA or INEEL background	Risks to mammalian carnivores (coyote) (Based on maximum HQs >10) due to: • Barium—WAG 1,2,4,9 • Cadmium—WAGs 1,2,4,5,9 • Chromium VI—WAG 5,9 • Mercury—WAGs 1,2,4 Risks could not be assessed due to lack of TRVs for the following inorganic COPCs: • Sulfide in sediment at CPP 67 in WAG 3 (Percolation Ponds #1 and #2)

Table 17-26. (continued).

Ecological Receptor	Functional Groups Represented	Assessment Endpoint No. from Appendix H6	Results of the 1997 OU 10-04 ERA sampling (INTEC area only)	Results of WAG ERAs
Townsend's western big-eared bat	Mammalian insectivores (M210A)	3	For the limited area encompassed by the 1997 CPP sampling, risks to small insectivorous mammals are negligible due to metals and radionuclides and are less than or equal to the RSA or INEEL background	Risks to mammalian insectivores (bat) (Based on maximum HQs >10) due to: • Arsenic—WAGs 1,2,3,4,5,9 • Antimony—WAGs 1,2,5,9 • Barium—WAGs 1,2,3,4,9,6/10 (NODA #2, NODA #3) • Cadmium—WAGs 1,2,3,4,5,9,6/10 (NODA #2) • Chromium VI—WAGs 1,3,4,5,9 • Cobalt—WAGs 1,5 • Copper—WAGs 1,2,4,5,9,6/10 • Lead—WAGs 1,2,6/10 (STF-02 Berm) • Manganese—WAGs 1,9 • Mercury—WAGs 1,2,3,4,5,9 • Nickel—WAGs 1,3,4,5,9 • Selenium—WAGs 1,2,3,4,5,9 • Silver—WAGs 1,25,9 • Thallium—WAGs 1,2,5 • Vanadium—WAGs 1,2,5,9 • Zinc—WAGs 1,2,4,5,9 • TPH—WAGs 1,3 • 2-methylnaphthalene—WAGs 1 • Xylene—WAGs 4 Risks could not be assessed due to lack of TRVs for the following inorganic COPCs: • Sulfide in sediment at CPP 67 in WAG 3 (Percolation Ponds #1 and #2)

Table 17-26. (continued).

Ecological Receptor	Functional Groups Represented	Assessment Endpoint No. from Appendix H6	Results of the 1997 OU 10-04 ERA sampling (INTEC area only)	Results of WAG ERAs
Loggerhead shrike	Avian carnivores (AV322)	3	For the limited area encompassed by the 1997 CPP sampling, risks to carnivorous birds are negligible due to metals and radionuclides and are less than or equal to the RSA or INEEL background	Risks to avian carnivores (loggerhead shrike) (Based on maximum HQs >10) due to: • Cadmium—WAG 1,2,5,9,6/10 • Chromium III—WAG 9 • Cyanide—WAG 9 • Lead—WAGs 1,2,4,5,9,6/10 (STF-02 Berm) • Mercury—WAG 1 • Zinc—WAG 1 Risks could not be assessed due to lack of TRVs for inorganic COPCs including the following: • Antimony • Barium • Chromium VI • Strontium • Sulfide in sediment at CPP 67 in WAG 3 (Percolation Ponds #1 and #2) • Risks could not be assessed due to lack of TRVs for organic COPCs including the following: • 1,3,-dinitrobenzene • 2,4-dinitrobtoluene • 2-methynaphthalene • 2,4,6-trinitrotoluene • HMX • RDX • TPH • Xylene

Table 17-26. (continued).

Ecological Receptor	Functional Groups Represented	Assessment Endpoint No. from Appendix H6	Results of the 1997 OU 10-04 ERA sampling (INTEC area only)	Results of WAG ERAs
Ferruginous hawk	Avian carnivores (AV322)	3	For the limited area encompassed by the 1997 CPP sampling, risks to carnivorous birds are negligible due to metals and radionuclides and are less than or equal to the RSA or INEEL background	Risks to avian carnivores (hawk) (Based on maximum HQs >10) due to: • Cadmium—WAGs 1,2,5,9 • Chromium III—WAG 9 • Cyanide—WAGs 9 • Lead—WAGs 1,2,4,5,9 • Mercury and zinc—WAG 1 Risks could not be assessed due to lack of TRVs for inorganic COPCs including the following: • Antimony • Barium • Beryllium • Boron • Chromium VI • Silver Sulfide in sediment at CPP 67 in WAG 3 (Percolation Ponds #1 and #2) Risks could not be assessed due to lack of TRVs for organic COPCs including the following: • Benzo(g,h,i)perylene • Chrysene • HMX • 1,3,-dinitrobenzene • 2,4-dinitrobtoluene • 2-methynaphthalene • 2,4,6-trinitrotoluene • Pentachlorophenol • RDX • Tetryl • TPH • Xylene

Table 17-26. (continued).

Ecological Receptor	Functional Groups Represented	Assessment Endpoint No. from Appendix H6	Results of the 1997 OU 10-04 ERA sampling (INTEC area only)	Results of WAG ERAs
Burrowing owl	Avian carnivores (AV322A)	3	For the limited area encompassed by the 1997 CPP sampling, risks to carnivorous birds are negligible due to metals and radionuclides and are less than or equal to the RSA or INEEL background	Risks to avian carnivores (burrowing owl) (Based on maximum HQs >10) due to: • Cadmium—WAG 1,2,5,9,6/10 • Chromium III—WAG 9 • Cyanide—WAG 9 • Lead—WAGs 1,2,4,5,9,6/10 (STF-02 Berm) • Mercury—WAG 1 • Zinc—WAG 1 Risks could not be assessed due to lack of TRVs for inorganic COPCs including the following: • Antimony • Barium • Chromium VI • Strontium • Sulfide in sediment at CPP 67 in WAG 3 (Percolation Ponds #1 and #2) • Risks could not be assessed due to lack of TRVs for organic COPCs including the following: • 1,3,-dinitrobenzene • 2,4-dinitrobtoluene • 2-methynaphthalene • 2,4,6-trinitrotoluene • HMX • RDX • TPH • Xylene

Table 17-26. (continued).

Ecological Receptor	Functional Groups Represented	Assessment Endpoint No. from Appendix H6	Results of the 1997 OU 10-04 ERA sampling (INTEC area only)	Results of WAG ERAs
Mourning dove	Avian herbivores (AV122)	3,5	For the limited area encompassed by the 1997 CPP sampling, risks to herbivorous birds are negligible due to metals and radionuclides and are less than or equal to the RSA or INEEL background	Risks to avian herbivores (mourning dove) (Based on maximum HQs >10) due to: • Cadmium—WAG 1,2,9 • Chromium III—WAG 9 • Cobalt—WAG 6/10 (NODA #3) • Lead—WAG 1,2,5,9,6/10 • Mercury—WAGs 1,2,3,4,5,9 • Zinc—WAG 1,9 Risks could not be assessed due to lack of TRVs for inorganic COPCs including the following: • Antimony • Barium • Beryllium • Boron • Chromium VI • Silver • Strontium • Sulfide in sediment at CPP 67 in WAG 3 (Percolation Ponds #1 and #2) • Cyanide at WAGs 1,3,9 • Tin Risks could not be assessed due to lack of TRVs for organic COPCs including the following: • Benzo(g,h,i)perylene • Chrysene • HMX • 1,3,-dinitrobenzene • 2,4-dinitrobtoluene • 2-methynaphthalene • 2,4,6-trinitrotoluene • Pentachlorophenol • RDX • Tetryl • TPH • Xylene

Table 17-26. (continued).

Ecological Receptor	Functional Groups Represented	Assessment Endpoint No. from Appendix H6	Results of the 1997 OU 10-04 ERA sampling (INTEC area only)	Results of WAG ERAs
Blue-winged teal	Avian (aquatic) herbivores (AV143)	4,5	Aquatic receptors were not assessed by the 1997 OU 10-04 ERA sampling; however risks to other avian species are expected to address this receptor.	No risks to avian herbivores (duck) (Based on maximum HQs >10). Risks could not be assessed due to lack of TRVs for inorganic COPCs including the following: • Antimony • Barium • Beryllium • Boron • Chromium VI • Silver • Strontium • Sulfide in sediment at CPP 67 in WAG 3 (Percolation Ponds #1 and #2) • Cyanide at WAGs 1,3,9 • Tin Risks could not be assessed due to lack of TRVs for organic COPCs including the following: • Benzo(g,h,i)perylene • Chrysene • HMX • 1,3,-dinitrobenzene • 2,4-dinitrobtoluene • 2-methynaphthalene • 2,4,6-trinitrotoluene • Pentachlorophenol • RDX • Tetryl • TPH • Xylene

Table 17-26. (continued).

Ecological Receptor	Functional Groups Represented	Assessment Endpoint No. from Appendix H6	Results of the 1997 OU 10-04 ERA sampling (INTEC area only)	Results of WAG ERAs
Sage sparrow	Avian insectivores (AV222)	3	For the limited area encompassed by the 1997 CPP sampling, risks to insectivorous birds are negligible due to metals and radionuclides and are less than or equal to the RSA or INEEL background	Risks to avian insectivores (sage sparrow) (Based on maximum HQs >10) due to: • Arsenic—WAGs 1,2,9 • Cadmium—WAGs 1,2,4,5,9 • Chromium III—WAG 9 • Cobalt—WAGs 1,5 • Copper—WAG 1,5,9 • Cyanide—WAGs 1,9 • Lead—WAGs 1,2,3,4,5,9,6/10 (STF-02 Berm) • Mercury—WAGs 1,2,3,4 • Nickel—WAGs 4,9 • Selenium—WAGs 1,2,5,9 • Silver—WAGs 4 • Thallium—WAGs 1,2,.5 • Vanadium—WAGs 1,2,5,9 • Zinc—WAGs 1,2,4,5,9 Risks could not be assessed due to lack of TRVs for inorganic COPCs including the following: • Antimony • Barium • Beryllium • Boron • Chromium VI • Silver • Strontium • Sulfide in sediment at CPP 67 in WAG 3 (Percolation Ponds #1 and #2) • • Tin Risks could not be assessed due to lack of TRVs for organic COPCs including the following: • Benzo(g,h,i)perylene • Chrysene • HMX • 1,3,-dinitrobenzene • 2,4-dinitrobtoluene • 2-methynaphthalene • 2,4,6-trinitrotoluene • Pentachlorophenol • RDX • Tetryl • TPH • Xylene

Table 17-26. (continued).

Ecological Receptor	Functional Groups Represented	Assessment Endpoint No. from Appendix H6	Results of the 1997 OU 10-04 ERA sampling (INTEC area only)	Results of WAG ERAs
Black-billed magpie	Avian omnivores (AV422)	3	For the limited area encompassed by the 1997 CPP sampling, risks to omnivorous birds are negligible due to metals and radionuclides and are less than or equal to the RSA or INEEL background	Risks to avian omnivores (magpie) (Based on maximum HQs >10) due to: • Chromium III—WAG 9 • Cobalt—WAG 6/10 • Lead—WAG 1,2,5,6/10 (STF-02 Berm) • Mercury—WAG 1 • Selenium—WAG 1,2,9 • Zinc—WAG 1,9 Risks could not be assessed due to lack of TRVs for inorganic COPCs including the following: • Antimony • Barium • Boron • Chromium VI • Silver • Sulfide in sediment at CPP 67 in WAG 3 (Percolation Ponds #1 and #2) Risks could not be assessed due to lack of TRVs for organic COPCs including the following: • Benzo(g,h,i)perylene • HMX • 1,3,-dinitrobenzene • 2,4-dinitrobtoluene • 2-methynaphthalene • 2,4,6-trinitrotoluenePentachlorophenol • RDX • Tetryl • TPH • Xylene

Table 17-27. Receptors of concern and associated functional groups with HQs exceeding 10for OU 10-04 COPCs.

COPC	Avian herbivore (Mourning dove) (AV122)	Avian (aquatic) herbivore (Blue-winged teal) (AV143)[c]	Avian insectivore (Sage sparrow) (AV222)	Avian carnivore (Ferruginous Hawk, Loggerhead shrike) (AV322)	Avian carnivore (Burrowing owl) (AV322A)	Avian omnivore (Black-billed magpie) (AV422)	Mammalian herbivore (Mule deer) (M122)	Mammalian herbivore (Pygmy rabbit) (M122A)	Mammalian insectivore (Townsend's western big-eared bat) (M210A)	Mammalian omnivore (Deer mouse) (M422)	Mammalian carnivore (Coyote) (M322)	Plants
TPH	0/8[a]	NA	0/8	0/8	0/8	0/8	2/8	2/8	2/8	1/8	0/8	0/8
1,3-Dinitrobenzene	0/8[a]	NA	0/8	0/8	0/8	0/8	0/8	1/8	0/8	1/8	0/8	0/8
2,4-Dinitrotoluene	0/8	NA	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/8
2-Methylnaphthalene	0/8	NA	0/8	0/8	0/8	0/8	0/8	1/8	1/8	0/8	0/8	0/8
2,4,6-Trinitrotoluene	0/8	NA	0/8	0/8	0/8	0/8	0/8	1/8	0/8	1/8	0/8	0/8
RDX	0/8	NA	0/8	0/8	0/8	0/8	1/8	1/8	0/8	1/8	0/8	0/8
Xylene	0/8	NA	0/8	0/8	0/8	0/8	1/8	1/8	1/8	2/8	0/8	0/8
Arsenic	0/8	NA	3/8	0/8	0/8	0/8	0/8	0/8	6/8	3/8	0/8	0/8
Antimony	0/8	NA	0/8	0/8	0/8	0/8	0/8	0/8	4/8	1/8	0/8	1/8
Barium	0/8	NA	0/8	0/8	0/8	0/8	5/8	5/8	6/8	6/8	4/8	0/8
Cadmium	3/8	NA	5/8	5/8	2/8	0/8	7/8	7/8	7/8	7/8	5/8	1/8
Chromium[b]	1/8	NA	1/8	1/8	0/8	1/8	4/8	4/8	5/8	4/8	2/8	4/8
Cobalt	1/8	0/8	2/8	0/8	0/8	1/8	2/8	1/8	2/8	1/8	0/8	1/8
Copper	0/8	NA	3/8	0/8	0/8	0/8	5/8	4/8	6/8	6/8	0/8	1/8
Cyanide	0/8	NA	2/8	1/8	0/8	1/8	0/8	0/8	0/8	0/8	0/8	0/8
Lead	5/8	NA	7/8	6/8	2/8	4/8	2/8	1/8	3/8	2/8	0/8	1/8
Manganese	0/8	NA	0/8	0/8	0/8	0/8	2/8	3/8	2/8	1/8	0/8	0/8
Mercury	6/8	NA	4/8	1/8	1/8	1/8	6/8	7/8	6/8	6/8	3/8	5/8
Nickel	0/8	NA	2/8	0/8	0/8	0/8	1/8	0/8	5/8	3/8	0/8	0/8
Selenium	0/8	NA	4/8	0/8	0/8	2/8	4/8	1/8	6/8	4/8	0/8	1/8
Silver	0/8	NA	1/8	0/8	0/8	0/8	3/8	1/8	4/8	1/8	0/8	5/8
Strontium	0/8	NA	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/8

Table 17-27. (continued).

COPC	Avian herbivore (Mourning dove) (AV122)	Avian (aquatic) herbivore (Blue-winged teal) (AV143)[c]	Avian insectivore (Sage sparrow) (AV222)	Avian carnivore (Ferruginous Hawk, Loggerhead shrike) (AV322)	Avian carnivore (Burrowing owl) (AV322A)	Avian omnivore (Black-billed magpie) (AV422)	Mammalian herbivore (Mule deer) (M122)	Mammalian herbivore (Pygmy rabbit) (M122A)	Mammalian insectivore (Townsend's western big-eared bat) (M210A)	Mammalian omnivore (Deer mouse) (M422)	Mammalian carnivore (Coyote) (M322)	Plants
Thallium	0/8	NA	3/8	0/8	0/8	0/8	2/8	0/8	3/8	2/8	0/8	2/8
Vanadium	0/8	NA	4/8	0/8	0/8	0/8	1/8	0/8	4/8	3/8	0/8	0/8
Zinc	2/8	NA	5/8	2/8	1/8	2/8	5/8	5/8	5/8	2/8	0/8	2/8
Radionuclides:	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Am-241, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Pu-238, Pu-239, Pu-239/240, Sr-90, U-235, U-238, Tritium												

a. Represents frequency of criteria exceedance (i.e., HQs > 10) over the number of WAGs evaluated for OU 10-04 COPCs.
b. Chromium III and VI results were combined. Chromium is not generally found in the VI form in the INEEL environment.
Results for TNT and RDX are taken from the risk assessment presented in Appendix F. RDX, TNT (and its biodegradation products), and radionuclides are maintained as COPCs due to common presence and remediation activities as discussed in text.
c. No home range was established for this functional group so no HQ values were calculated.
NA = not applicable. Radionuclides were retained for the OU 10-04 ERA regardless of HQs.